

Effect of Different Levels of Moisture, Sugar and Fat on Consistency of Shrikhand

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ABSTRACT

The present study was carried out to assess the effect of various levels of moisture, sugar and fat on consistency of shrikhand. Twenty-seven shrikhand lots were prepared with different levels of moisture (30-35, 35-40 and 40-45%), sugar (70, 80 and 90% added on the basis of weight of chakka) and fat (4, 6 and 8%), with the uniform mixing treatment while blending the ingredients. The consistency was measured at 30° C for freshly prepared samples and at 10° C for refrigerated samples using a cone penetrometer and the values were reported in mm of penetration. At minimum levels of parameters under study, the consistency was maximum at both the temperatures of measurement and vice-versa. The penetrometer reading taken at 30° C and 10° C ranged from 38.9-47.2 and 22.4-27.4 mm, respectively.

Various levels of moisture, sugar and fat significantly affected the consistency of shrikhand. Increasing levels of these parameters resulted in higher penetration, thereby causing reduction in firmness. The moisture showed pronounced effect on shrikhand consistency followed by sugar and fat. The interaction effect of all the parameters was found non-significant which reflected the individuality of the attributes studied.

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INTRODUCTION

Shrikhand, a delicious indigenous fermented milk product, which enjoys a status of summer season's novelty, is very much popular in certain parts of our country. The product owes its popularity to refreshing taste, pleasing aroma, smooth homogeneous texture and firm semisolid consistency. However, information on various factors affecting

the above characteristics of shrikhand is scanty. Therefore, a study was planned to know the effect of changes in fat, sugar and moisture contents on consistency of shrikhand.

MATERIALS AND METHODS

In the present study, 27 different lots of shrikhand were prepared with various levels of fat (4, 6 and 8%), sugar

(70, 80 and 90% on the basis of weight of chakka) and moisture (30-35, 35-40 and 40-45%). The samples were also collected from two popular manufacturers of shrikhand located in Baroda city to have the relative assessment of market and laboratory samples of shrikhand.

Preparation of Chakka:

Fresh buffalo skim milk, obtained from the Students' Training Dairy was heated to 90° C for 10 minutes, followed by cooling to incubation temperature (29-32° C). It was inoculated with LF-40 starter culture (NDRI, Karnal) at the rate of 1% and incubated for 12-15 hours at above temperature till the curd attained the desired firmness and acidity of 0.8% L.A. The curd so obtained was converted into chakka by partial removal of whey using a batch type vacuum whey drainer developed by Shah and Sharma (unpublished work). The curd was evenly spreaded on shallow perforated pan of the vacuum drainer which was lined with six folds of muslin cloth. A vacuum of 0.7 to 0.8 kg/cm² was employed for 20-25 minutes to achieve desired draining. The resultant chakka was kneaded over a stainless steel wire mesh sieve (144 pores/cm²) and its final moisture content was adjusted to get predetermined levels of moisture in the finished product.

Preparation of Shrikhand:

The chakka with pre-adjusted levels of moisture was mixed with appropriate quantities of sugar and pasteurized cream (70%) so as to obtain desired levels of moisture, sugar and fat in the finished product. The mixing of ingredients, namely, sugar and cream was effected manually by application of 60

to and fro strokes (length of stroke about 20 cm.) using a stainless steel laddle. The product was filled in glass bowls and stored at 5°C for 12 hours. The samples for chemical analysis were drawn immediately after mixing the content.

Compositional analysis of shrikhand:

The samples of shrikhand were analysed for moisture, protein (IS 1479, Part-II, 1961), fat by Rose Gottlieb method (Bianco *et al.*, 1978), sucrose by colorimetric method (Pantulu *et al.*, 1976) total sugar (IS : 2802, 1964), titratable acidity (Aneja *et al.*, 1977) and pH (Franklin and Sharpe, 1963). All values reported were the average of duplicates.

Measurement of consistency of shrikhand:

The consistency of shrikhand samples was determined penetrometrically, as per the method described by Hartman (1976). The measurements, using AIMIL cone penetrometer, were made at 30°C immediately after preparation and at 10°C after refrigerated storage (at 5°C for 12 hours). Average values of four successive readings on a sample were recorded and reported as mm (millimeters) of penetration, and subjected to statistical analysis as per the method for 3³ completely randomized factorial design (Snedecor and Cochran, 1968).

RESULTS AND DISCUSSION

The data indicated in Table-I showed that there were no wide variations between the desired and actual values of moisture and fat contents of experimental shrikhand samples. The

moisture content remained well within the predetermined ranges of 30-35, 35-40 and 40-45 % and the fat fluctuated for a difference ranging from -0.02 to +0.35 %. The analytical results showed that sucrose content of experimental samples was

TABLE 1

Chemical composition of laboratory samples of Shrikhand.

Attributes	Contents (%)	
	Desired	Actual
Moisture	30-35	31.20-33.64
	35-40	37.81-39.03
	40-45	41.33-43.77
Fat	4	3.98-4.22
	6	6.03-6.18
	8	8.05-8.35
Sucrose	36-39* (70)	36.43-38.81
	39-42 (80)	49.60-41.98
	42-45 (90)	41.78-44.71
Total Sugar	—	37.88-40.52
	—	41.35-43.63
	—	43.44-46.38
Protein	—	6.92-7.81
Acidity	—	0.825-1.093
pH	—	4.28-4.74

Figures in parenthesis indicate rate of addition of cane sugar on the basis of weight of chakka.

*Calculated desired sucrose content.

within the calculated expected values of 36-37, 39-42 and 42-45 % at each levels of 70, 80 and 90 % (on basis of weight of

chakka) of sugar addition respectively and the total sugar content ranged from 37.88-46.38 %. A range of 6.92-7.81 % protein content observed with the experimental samples could be regarded as normal in the light of results reported by Sharma and Zariwala (1978) and Upadhyay (1981). As the acidity greatly influences the organoleptic quality of product, efforts were made to limit the variations in acidity of the product within a practicable narrow range. It was observed that the acidity as per cent lactic acid and pH ranged from 0.825-1.093 and 4.28-4.74 % respectively. Such fluctuations in the acidity of shrikhand is normally expected and similar acidity values for the shrikhand prepared by industrial process have been reported by Aneja *et al.* (1977).

The data reported in Table-2 indicated no wide variations within the two market samples of shrikhand in their chemical composition, excepting fat content which varied widely.

It was observed that the market samples obtained during present investigation and experimental samples were comparable with regard to their moisture, sucrose, total sugar and protein contents. However, the market samples studied had relatively higher acidity (1.33 % as L.A.) than experimental samples and one out of the two market samples had exceptionally high fat content (10.15 %).

The effects of various levels of moisture, sugar and fat on consistency of fresh and stored (at 5°C for 12 hours) shrikhand samples, in terms of penetrometer reading, reported as mm of penetration of a cone are presented in Table-3.

TABLE 2

Chemical composition of market samples of shrihand.

Sample	Parameters						
	Mois- ture	Fat	Added Sugar	Total Sugar	Protein	Acidity	pH
				%			
1	36.49	10.15	43.29	45.03	7.52	1.265	4.24
2	44.22	5.25	40.89	42.42	6.51	1.341	3.59

TABLE 3

Effect of moisture, fat and sugar on consistency of Shrikhand.

Range Moisture desired (%)	Fat desired (%)	Sugar added to chakka (%)					
		70		80		90	
		Penetrometer reading in mm : at					
		10°C	30°C	10°C	30°C	10°C	30°C
30-35	4	22.4	38.0	23.0	38.6	23.5	39.3
	6	22.8	38.3	23.2	38.9	23.8	39.6
	8	23.2	38.5	23.6	39.2	24.1	39.8
35-40	4	24.1	41.4	24.6	42.2	25.4	42.5
	6	24.4	41.7	24.8	42.3	25.5	42.7
	8	24.7	42.0	25.2	42.6	25.8	43.1
40-45	4	25.4	45.5	26.1	45.9	26.8	46.5
	6	26.0	45.7	26.4	46.2	27.1	47.1
	8	26.3	45.9	26.8	46.5	27.4	47.2

Sample Penetrometer Reading (mm) of market samples of shrihand at

	10°C	30°C
1	27.3	42.3
2	33.9	47.7

It can be observed from the table that with the increase in percentage of moisture, sugar or fat, the penetrometer reading also increased. A highly firm product was obtained when all parameters under study were kept at minimum level and vice-versa. The penetrometer reading of product as above was 38.0 at 30°C and 22.4 at 10°C. The weakest product had penetrometer readings of 47.2 and 27.4 at 30°C and 10°C, respectively.

On increasing the moisture content from a range of 30-35% to a range of 40-45%, penetration increased by 7.5 mm at 30°C (38.0-45.5 mm) and 3.0 mm at 10°C (22.4-25.4 mm) in the shrikhand containing 4.0% fat prepared from maska blended with 70% sugar. At intermediate level of 35-40% moisture, the increase in penetration was only 3.4 mm (38.0-41.4 mm) and 1.7 mm (22.4-24.1 mm) at 30°C and 10°C, respectively. Similarly, at 30-35% moisture and 4% fat levels, penetrometer reading increased from 38.0 to 39.3 at 30°C and 22.4 to 23.5 at 10°C when percentage sugar added to maska increased from 70 to 90%. At 80% level of sugar addition, the observed values were 38.6 at 30°C and 23.0 at 10°C. With the increase in fat level from 4 to 6% at a moisture level of 30-35% and at 70% sugar addition to maska, the penetrometer reading showed an increase of 0.3 mm at 30°C (38.0-38.3 mm) and 0.4 mm at 10°C (22.4-22.8 mm). Almost similar increase was observed on raising the fat content from 6 to 9%.

For all these attributes studied at all individual levels, a similar trend towards the effect on consistency of shrikhand was observed at both the temperatures of measurements. Increasing mois-

ture, sugar or fat, keeping any two constant, increased the penetrometer reading resulting in reduction in the firmness of the product. The mean values of each parameters were found significantly different at all levels studied. The effect of moisture on penetrometer value was remarkably higher than the effect exhibited by either sugar or fat. Similarly, the effect of sugar was more in comparison to the effect of fat. However, the interaction effect of all the experimental variables showed non-significant behaviour indicating that any of the three attributes can be altered to get desired consistency of product. The firm consistency of shrikhand observed at lower temperature (10°C) of measurement in refrigerated samples, as compared to fresh product could probably be attributed to partial solidification of fat and to changed configuration of casein micelles, leading to the structural solidification of gel during cooling.

The market samples had very high penetration values at both the temperatures studied (Table-3). The sample-1 was comparable in consistency to the experimental sample prepared with 35-40% moisture and 8% fat at 90% sugar level, the penetrometer reading being 42.3 at 30°C and 27.3 at 10°C for the former and 43.1 at 30°C and 25.8 at 10°C for the latter. In comparison, the second market samples had weaker consistency which may be ascribed to difference in manufacturing technique, temperature/storage history of sample and compositional differences.

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